

## Patent Claims

### Opalescent Glass Ceramic

1. An opalescent glass ceramic, in particular an opalescent glass ceramic as a dental material or as an additive to or component of dental material, comprising at least the components  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{P}_2\text{O}_5$ ,  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{O}$ ,  $\text{CaO}$  and  $\text{Me(IV)O}_2$ , characterized in that the opalescent ceramic is devoid of  $\text{ZrO}_2$  and  $\text{TiO}_2$ , that the glass ceramic has a  $\text{Me(II)O}$  content of less than 4% by weight and that the  $\text{Me(IV)O}_2$  content is 0.5 to 3% by weight.
2. The opalescent glass ceramic according to claim 1, characterized in that  $\text{Me(IV)O}_2$  is composed of 0 - 1% by weight  $\text{CeO}_2$  and 0 - 2.5% by weight  $\text{SnO}_2$ .
3. The opalescent glass ceramic according to claim 1, characterized in that the  $\text{Me(II)O}$  content is 2 - 3.5% by weight, in particular 2.5 - 3% by weight.
4. The opalescent glass ceramic according to any one of the claims 1 to 3, characterized in that the glass ceramic contains the following components:

Component	% by weight
$\text{SiO}_2$	55 - 62
$\text{Al}_2\text{O}_3$	13 - 17
$\text{B}_2\text{O}_3$	0 - 2
$\text{P}_2\text{O}_5$	1.5 - 3
$\text{Li}_2\text{O}$	0 - 2
$\text{Na}_2\text{O}$	7 - 12
$\text{K}_2\text{O}$	8 - 12
$\text{MgO}$	0 - 2
$\text{CaO}$	1 - 4
$\text{BaO}$	0 - 2
$\text{Tb}_2\text{O}_3$	0 - 3
$\text{Me(IV)O}_2$	0.5 - 3

the indicated amount of Me(IV)O<sub>2</sub> being composed of 0 - 1% by weight CeO<sub>2</sub> and 0 - 2.5% by weight SnO<sub>2</sub>.

5. The opalescent glass ceramic according to any one of the claims 1 to 3, characterized in that the glass ceramic contains the following components:

Component	% by weight
SiO <sub>2</sub>	58 - 60
Al <sub>2</sub> O <sub>3</sub>	14 - 15
P <sub>2</sub> O <sub>5</sub>	2.3 - 2.6
Na <sub>2</sub> O	9.5 - 10.5
K <sub>2</sub> O	9 - 10
CaO	2.8 - 3.0
SnO <sub>2</sub>	1.3 - 1.6
CeO <sub>2</sub>	0.3 - 0.4
Tb <sub>2</sub> O <sub>3</sub>	0 - 2.0

6. The opalescent glass ceramic according to at least one of the preceding claims, characterized in that CeO<sub>2</sub> and/or Tb<sub>2</sub>O<sub>3</sub> are fused to obtain a fluorescent property.
7. The opalescent glass ceramic according to at least one of the preceding claims, characterized in that the glass ceramic has a thermal expansion coefficient (TEC) in the range of 9.0 - 13.5 x 10<sup>-6</sup>/K, in particular 10.5 - 12.0 x 10<sup>-6</sup>/K.
8. A method for producing an opalescent glass ceramic according to any one of the claims 1 to 7, in particular an opalescent glass ceramic as a dental material or as an additive to or component of dental material, comprising at least the components SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, P<sub>2</sub>O<sub>5</sub>, Na<sub>2</sub>O, K<sub>2</sub>O, CaO and Me(IV)O<sub>2</sub>, characterized in that the method comprises the

following procedural steps:

- weighing in and mixing the components with a mixing ratio according to one of the claims 1 to 6;
  - melting the mixture in a furnace;
  - quenching the molten mass coming out of the furnace in a water bath and subsequent drying;
  - grinding the frit thus obtained in a mill;
  - tempering the frit;
  - after drying, filling the frit in a mill and grinding the frit;
  - sifting the ground frit through a sieve, the sieve opening forming the end.
9. The method according to claim 8, characterized in that the tempering of the frit is carried out in the following manner:
- stacking the ground frits on quartz-coated fire-clay plates,
  - placing the fire-proof plates in a furnace, e.g. an electric furnace, heated to a temperature  $T$  with  $850^{\circ}\text{C} \leq T \leq 1000^{\circ}\text{C}$ ,
  - removing the plates from the furnace after a time  $t$  with  $30 \text{ min} \leq t \leq 60$ ,
  - quenching the melted frit cakes in a water bath.
10. The method according to claim 8 or 9, characterized in that the components are mixed in a gyro mixer.
11. The method according to at least one of the claims 8 to 10, characterized in that the mixture is melted in a preferably gas-heated drip-feed crucible furnace.
12. The method according to at least one of the claims 8 to 11, characterized in that after drying, the frit is filled into a ball mill and ground with about 10,000 revolutions per minute.
13. The method according to at least one of the claims 8 to 12,

characterized in that the ground frit is preferably sifted through a sieve having a mesh size  $M$  in the range of  $80\text{ }\mu\text{m} \leq M \leq 120\text{ }\mu\text{m}$ , preferably  $M = 100\text{ }\mu\text{m}$ .

14. The method according to at least one of the claims 8 to 13, characterized in that the fusing is produced by heating the granulated material to  $870$  to  $970^{\circ}\text{C}$ .
15. The method according to at least one of the claims 8 to 14, characterized in that the thermal expansion coefficient (TEC) is set to a value  $9.0 \leq \text{TEC} \leq 13.5 \times 10^{-6}/\text{K}$  by the  $\text{K}_2\text{O}$  content.
16. The method according to at least one of the claims 8 to 15, characterized in that the baking temperature of the opalescent glass ceramic is controlled by the proportions of  $\text{B}_2\text{O}_3$ ,  $\text{Li}_2\text{O}$  and  $\text{Na}_2\text{O}$  and is preferably in the range of  $870^{\circ}\text{C}$  to  $970^{\circ}\text{C}$ .
17. Use of the opalescent glass ceramic according to at least one of the preceding claims as a dental material or as an additive to or component of dental material.
18. The use according to claim 17, wherein the opalescent glass is a component of inlays, onlays, bridges or crowns.